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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
HUBER, PAUL W	
ART UNIT	**PAPER NUMBER**
2653	3

DATE MAILED: 03/31/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/900,662	NICKEL	
	Examiner	Art Unit	
	Paul Huber	2653	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2 .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, 5-8, 11, 12, and 14-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Chen et al. (USP-6,542,400).

Chen et al discloses a data storage device comprising an array of nanotubes 50 as electron sources. See figure 3 and col. 6, lines 40-41.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al, as applied to the claims above, considered with Choi et al (USP-6,472,802).

Chen et al as applied to the claims above discloses the invention as claimed, but fails to specifically teach that the nanotubes are boron nitride nanotubes. However, it is manifestly well known in the art that nanotubes can be made up of boron nitride instead of carbon (see for example, Choi et al, col. 3, lines 48-49), in the same field of endeavor, for the purpose of using an alternative material which is suitable for nanotube technology which may meet the manufacturer's demand and expense.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chen et al such that the nanotubes are boron nitride nanotubes instead of carbon based, as well known in the art and as taught by Choi et al. A practitioner in the art would have been motivated to do this for the purpose of using an alternative material which is suitable for nanotube technology which may meet the manufacturer's demand and expense.

Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al, as applied to claim 1 above, in further view of Gibson et al (USP-5,557,596).

Chen et al as applied to claim 1 above disclose the invention as claimed, but fails to specifically teach that the storage medium includes a phase-change storage layer. Gibson et al discloses a data storage device comprising an array of electron sources for storing and reproducing information from a phase-change material (see figure 4B), in the same field of endeavor, for the purpose of reversibly storing and reproducing information on a recording medium at extremely high density.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Chen et al such that the storage medium includes a phase-change storage layer proximate the tips of the nanotubes as claimed and as taught by Gibson et al. A practitioner in the art would have been motivated to do this for the purpose of reversibly storing and reproducing information on a recording medium at extremely high density.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al and Choi et al, as applied to the claims above, in further view of Gibson et al (USP-5,557,596).

Choi et al as modified and applied to the claims above disclose the invention as claimed, but fails to specifically teach that the storage medium includes a phase-change storage layer. Gibson et al discloses a data storage device comprising an array of electron sources for storing and reproducing information from a phase-change material (see figure 4B), in the same field of endeavor, for the purpose of reversibly storing and reproducing information on a recording medium at extremely high density.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Chen et al such that the storage medium includes a phase-change storage layer proximate the tips of the nanotubes as claimed and as taught by Gibson et al. A practitioner in the art would have been motivated to do this for the purpose of reversibly storing and reproducing information on a recording medium at extremely high density.

Claims 1, 2, 7, 8, 11, 12, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas et al. (USP-6,498,349) considered with Danz et al. (USP-5,637,370).

Thomas et al discloses a digital direct write electron beam matrix lithograph system (see figure 4), including an emitter array 430 which is a two dimensional array of electron beam sources, wherein the "electron emitting materials can be based on carbon nanotubes (CNT)." (see col. 6, lines 9-11). Thomas et al discloses the invention as claimed, but fails to specifically teach that the digital direct write electron beam matrix lithograph system can be used for data storage. However, Danz et al teaches that "methods are known of inscribing information at extremely high information density into thin metal or semiconductor layers with a focused and accelerated electron beam[, and] by making use of the apparatus systems developed for electron beam lithography, it is possible to produce nanometer structures with line widths smaller than 10 nm" (col. 1, lines 8-13), in the same field of endeavor, for the purpose using lithography systems for high density storage of information.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Thomas et al such that the digital direct write electron beam matrix lithograph system of figure 4, which includes carbon nanotubes (CNT) as the emitter array 430, is used for data storage as taught by Danz et al. A practitioner in the art would have been motivated to do this for the purpose of using the lithography system of Thomas et al for high density storage of information.

Regarding claims 7 and 15, Thomas et al discloses a bias grid 440 which comprises the claimed word and bit lines for addressing each emitter of the EA 430 (nanotubes) as claimed.

Regarding claims 8 and 16, Thomas et al discloses in reference to figure 4 a micromover 470 for focus positioning of the array on the medium 420.

Claims 4 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas et al and Danz et al, as applied to the claims above, in further view of Gibson et al (USP-5,557,596).

Thomas et al as modified and applied to the claims above disclose the invention as claimed, but fails to specifically teach that the storage medium includes a phase-change storage layer. Gibson et al discloses a data storage device comprising an array of electron sources for storing and reproducing information from a phase-change material (see figure 4B), in the same field of endeavor, for the purpose of reversibly storing and reproducing information on a recording medium at extremely high density.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Thomas et al such that the storage medium includes a phase-change storage layer proximate the tips of the nanotubes as claimed and as taught by Gibson et al. A practitioner in the art would have been motivated to do this for the purpose of reversibly storing and reproducing information on a recording medium at extremely high density.

Claims 5, 6, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas et al and Danz et al, as respectfully applied to claims 1 and 11 above, in further view of Official Notice.

Thomas et al as modified and applied to the claims above discloses the invention as claimed, but fails to specifically teach that the nanotubes are elongated and have an aspect ratio of at least 10:1. However, it is manifestly well known in the art of nanotube technology that nanotubes are preferably elongated and made to have a higher aspect ratio such as at least 10:1 in order to provide better directionality, and Official Notice is hereby given.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Thomas et al such that the nanotubes are made to be elongated and have an aspect ratio of at least 10:1 as well known in the art. A practitioner in the art would have been motivated to do this for the purpose of providing better directionality to the nanotubes thereby improving emitter performance and accuracy.

Relative to the doctrine of Official Notice, see In re Fox, 176 U.S.P.Q. 340 at 341 (CCPA 1973).

Claims 3 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas et al and Danz et al, as respectfully applied to claims 1 and 11 above, in further view of Choi et al (USP-6,472,802).

Thomas et al as modified and applied to the claims above discloses the invention as claimed, but fails to specifically teach that the nanotubes are boron nitride nanotubes. However, it is manifestly well known in the art that nanotubes can be made up of boron nitride instead of carbon (see for example, Choi et al, col. 3, lines 48-49), in the same field of endeavor, for the purpose of using an alternative material which is suitable for nanotube technology which may meet the manufacturer's demand and expense.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Thomas et al such that the nanotubes are boron nitride nanotubes instead of carbon based, as well known in the art and as taught by Choi et al. A practitioner in the art would have been motivated to do this for the purpose of using an alternative material which is suitable for nanotube technology which may meet the manufacturer's demand and expense.

Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thomas et al, Danz et al, and Gibson et al, as respectfully applied to claim 9 above, in further view of Choi et al (USP-6,472,802).

Thomas et al as modified and applied to claim 9 above discloses the invention as claimed, but fails to specifically teach that the nanotubes are boron nitride nanotubes. However, it is manifestly well known in the art that nanotubes can be made up of boron nitride instead of carbon (see for example, Choi et al, col. 3, lines 48-49), in the same field of endeavor, for the purpose of using an alternative material which is suitable for nanotube technology which may meet the manufacturer's demand and expense.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to further modify Thomas et al such that the nanotubes are boron nitride nanotubes instead of carbon based, as well known in the art and as taught by Choi et al. A practitioner in the art would have been motivated to do this for the purpose of using an alternative material which is suitable for nanotube technology which may meet the manufacturer's demand and expense.

Any inquiry concerning this communication should be directed to Paul Huber at telephone number 703-308-1549.

Paul Huber
Primary Examiner
Art Unit 2653